Running Heading: Analysis of Proposed Medical Services

Demand Analysis for Proposed Medical Services at the Future Naval Health Clinic Charleston, South Carolina: A Graduate Management Project

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Abstract

The purpose of this study is to determine the scope of medical services that should be provided to enrolled beneficiaries at the future Naval Health Clinic Charleston based on projected demand and demographics of the population. Twelve months of historical relative value unit (RVU) workload data were used to conduct forecasts to project the future demand for healthcare services in 10 specialty practices. Two independent predictive models were created using time-series analysis and utilization rates from the population of interest. Projections were evaluated against Navy Medicine annual benchmark standards for clinical practices to determine if sufficient demand existed to provide each service. Both independent methodologies indicated the need for 5 of the 10 specialty practices evaluated in the study. Results of this study suggest the demographic make-up of the targeted population likely limits the need for certain specialty services that typically serve an older population.

Disclaimer

The views expressed in this presentation are those of the author and do not reflect the official policy or position of Baylor University, Department of the Navy , Department of the Army, Department of Defense, or the U.S. Government.

Statement of Ethical Conduct in Research

The data source for this research study is the Military Health System (MHS) Management Analysis and Reporting Tool, referred to as the MHS Mart (M2). No personal information that could be used to identify a research subject was obtained during the course of this study.

The author declares no conflict of interest or financial interest in any product or service mentioned in this article, including grants, employment, stock holdings, gifts, or honoraria.

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Introduction

The escalating costs of delivering healthcare to a growing beneficiary population and the current military operating tempo are presenting numerous challenges to the Military Health System (MHS). Military Treatment Facilities (MTFs) have been tasked with delivering cost-effective, high quality medical care while simultaneously supporting the global war on terrorism. The consequences of these dual mission requirements have been trying to meet patient expectations with constrained human and financial resources. As a result, MTF leaders have sought more efficient ways to conduct business with a much leaner workforce. This dilemma has led to the implementation of proven business practices, particularly emphasizing the use of quantitative analysis and data-driven decision making. Business cells have been established in many facilities to analyze business operations and make recommendations for increasing productivity and market share for profitable medical services delivered within the MTF.

The Bureau of Medicine and Surgery (BUMED), which is responsible for the overall administration of Navy medicine, has emphasized the importance of maximizing the value of care (VOC) and operating margins in its MTFs. The VOC is defined as the gross revenue generated by a facility or service. It is the mathematical product of the aggregate RVUs performed and the standard RVU rate or the CHAMPUS Maximum Allowable Charge (CMAC) rate charged for specific diagnoses. Conversely, the operating margin is the ratio of operating profits to revenues and is expressed as, VOC (Net revenues) – Operating Expenses / VOC. These financial measures are used to justify the allocation of resources to MTFs. Medical facilities or clinics that continually operate with negative operating margins or VOC can be forced to

undergo manpower or service line cuts if the care can be obtained at a lower cost through non-MTF network providers. These expectations of maximum productivity and financial performance have resulted in a more stringent evaluation of the medical services provided in MTFs, predominantly the costs, including staff, associated with providing this care within the facilities.

Statement of Purpose

The purpose of this study is to determine the scope of medical services that should be provided to enrolled beneficiaries at the future Naval Health Clinic (NHC) Charleston. The study is designed to identify the appropriate mix of specialty healthcare services to offer based on the projected demand and characteristics of the population to be served. A thorough evaluation of each proposed service is required to provide command leadership with the necessary information to make decisions regarding needed medical services and the provider resources to support them. Naval Hospital Charleston's ultimate goal is to provide an optimal range of medical services that maximizes the value of care and meets both the demand and medical needs of enrolled beneficiaries.

Background

Naval Hospital Charleston (NH) is a fully accredited, outpatient healthcare facility located in North Charleston, South Carolina. It provides comprehensive primary and specialty medical care services to over 62,000 eligible beneficiaries. The beneficiary population is comprised of active duty service members from the Navy, Air Force, and Coast Guard, their family members, and retirees. Currently, there are approximately 9,000 patients enrolled to this facility. An additional 13,100 patients are enrolled (MHS Management Analysis and Reporting Tool (M2), 2005) to the Branch Medical Clinic (BMC) Naval Weapons Station, Goose Creek, an outlying

clinic under the cognizance of the NH. The hospital is part of a multi-service healthcare market that is shared with the 437th Medical Group located at Charleston Air Force Base, which carries an enrollment of 12,300. The Commanding Officer (CO) of NHC serves as the senior market manager for the Charleston area. Other regional healthcare resources that partner with the NH are the Ralph H. Johnson Veterans Administration Medical Center (VAMC), Humana Military Health Services, and an established civilian health care network in the local community.

The NH is an independent medical command with an executive leadership team consisting of a CO, Executive Officer (XO), and a Command Master Chief (CMC). The CO and XO positions are synonymous with the Chief Executive Officer and Chief Operating Officer roles traditionally found in civilian hospitals. Directors for Resources (CFO), Administration (DFA), Primary Care (DPC), Ancillary Services (DAS), and Specialty Care (DSC) supplement this triad in execution of the command mission.

Conditions Prompting the Study

The existing hospital was built in 1973 to support Naval Station Charleston, Charleston Naval Shipyard, and other surrounding military activities. The population served by the NH began to shift as a result of a 1993 Base Realignment and Closure (BRAC) Congressional mandate that directed the closure of the Charleston Naval Shipyard. The closure occurred three years later and had a significant effect on the mission of the NH by greatly reducing the number of Navy active duty sailors and their family members who received care at the facility. Subsequently, reductions in the inpatient capacity of the hospital were initiated and continued over several years until it ceased providing inpatient care in 1998. The NH then established an External Resource Sharing Partnership with Trident Medical Center, a local hospital, to provide all of the medically necessary inpatient care for its beneficiaries. The command followed up this

agreement with cuts in its level of medical services but remained in the same building functioning as an outpatient care center.

The actions initiated as a result of the BRAC decision have resulted in several other closures of naval activities near the NH. The effects of these closures, along with the establishment of new naval commands at the Naval Weapons Station (NWS) Goose Creek, have caused a geographic shift in the patient population served by the NH. A majority of the beneficiary population who receive care at this facility are now located in the vicinity of the NWS in Goose Creek, South Carolina, roughly 15 miles from the current location of the hospital. In 2003, to help address this trend, construction was approved for a new medical facility at the NWS to replace the existing hospital. This health clinic will consist of a joint venture with the Department of Veterans Affairs (VA) establishing a Navy medical facility and a Community Based Outpatient Clinic (CBOC) at the same site. It is scheduled to open in September 2008. The facility will consolidate healthcare services for both the NH and the existing BMC located at the NWS. The purpose for the CBOC is to expand access to primary care and mental health services for veterans in the surrounding area who are geographically distant from the downtown Charleston VA Hospital.

Following approval of the facility construction proposal, the Manpower Requirements Determination Team (REDE) began working with the NH management to develop an Authorized Manning Document (AMD) for staffing the facility. The REDE team provides technical assistance and guidance on developing manpower requirements for staffing MTFs under the control of BUMED. The team conducted a position efficiency review in accordance with the Department of Defense Joint Healthcare Manpower Standards, and developed a staffing plan based on required man hours, population demographics, operational needs, and a proposed

command leadership structure for providing care to active duty service members (AD) and active duty family members (ADFM) planned for enrollment to the facility. As a result of the team's effort, the following primary and specialty medical services are currently planned to be offered directly at the NHC: (a) Aviation/Undersea Medicine, (b) Dermatology, (c) General Surgery, (d) Internal Medicine, (e) Mental Health/Psychiatry, (f) Obstetrics/Gynecology (OB/GYN), (g) Occupational Therapy/Physical Therapy, (h) Optometry, (i) Orthopedics, (j) Otolaryngology (ENT), (k) Pediatrics, (l) Primary Care/Family Medicine, and (m) Preventive/Occupational Medicine.

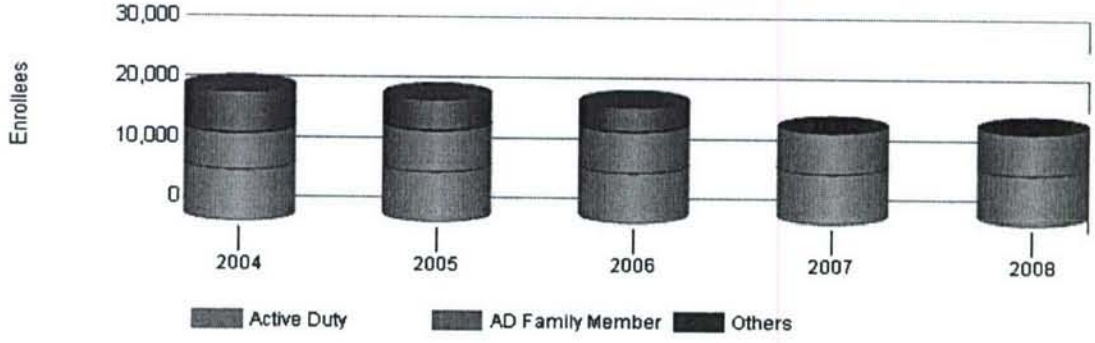

Figure 1. Beneficiary Enrollment Summary for Naval Hospital Charleston, Years 2004-2006 and 2007-2008 (Projected).

From Tri-Service Business Planning Tool, Multi-Market Service Office, 2005.

The population to be served was a major consideration in planning for the new facility. The projected enrollment population for the NHC in 2008 is 15,218 (Tri-Service Business Planning Tool, 2005) AD and ADFM enrollees. Early in the facility planning process, officials from Navy Medicine determined the new facility would not enroll retirees or their family members. Care would be provided to these individuals on a space-available basis only. Figure 1 illustrates the

enrolled population has slightly declined from 2004 to 2006. This trend is anticipated to continue as the NH transitions over 5000 enrolled retirees, represented in this table as others, to network providers. This transition will also coincide with the downsizing of the NH staff. However, the active duty military population and their family members, the target population for the new facility, are expected to remain relatively stable. In addition, significant shifts in the demographic composition of this population, specifically age and gender, are not anticipated to occur.

As part of the strategic planning process in 2005, the command adopted a strategic goal of developing a command transition plan for the move to the NHC. This plan begins with the analysis of established staffing guidelines and ends with a three-year plan to right-size the NH. A goal team was established to address the transition plan focusing on the phased elimination of medical services, reduction in staffing, and transitioning retired enrollees to the healthcare network. The NH currently has a staff of approximately 550 personnel and efforts to reduce overall staffing are ongoing, particularly addressing administrative overhead and provider needs. A major aspect of the transition plan is phased reductions in staffing to bring manning levels down to 326, the current approved manning structure for the NHC. Some of these reductions are expected to coincide with the elimination of medical services that are not planned to be offered at the new facility. The target date for completion of these organizational changes is May 2008 prior to the command's move to the NHC.

The focus on financial performance and optimization of resources has shifted the NH's future business model for the delivery of care. The command and its staff are dedicated to providing gainful, medically necessary healthcare to its patient population. In order to achieve this goal, leadership must reevaluate the current need for the planned medical services to be provided at the new command. Particularly, the command must identify what specialty care

services should be supplied and the manning levels of providers that will be needed to meet the expected consumer demand.

Literature Review

Numerous research studies and articles were reviewed for specific content related to planning specialty care services in military healthcare entities. No studies specifically related to the determination of appropriate specialty care services in MTFs were identified during the review. However, several sources identified contextual factors important to the study, mainly processes for determining workload and manpower requirements in civilian healthcare facilities.

Consumer Demand for Services

Consumer demand is a key factor for many healthcare organizations considering the pursuit of a new facility or service. Most decisions on whether or not to produce a service are based on the anticipated level of demand. The health planning process is one framework for a business to analyze the population it will serve and the demand for its service lines. Thomas (1999) described health planning as, "a process that appraises the overall health needs of a geographic area or population to determine how those needs can be met in the most effective and economical manner by existing and future facilities and programs" (p. 3). The process often yields information that identifies unmet health care needs that can drive the development of new services or allocation of resources within healthcare facilities. Bergwall, Reeves, & Woodside (1984) used the term requirements to describe the synonymous concepts of need and demand. They posited estimating requirements entails determining service requirements, which are derived from a detailed market analysis, and resource requirements, which are driven by the level of resources required to provide the service. Ultimately, these requirements should mirror the needs of the targeted population rather than the needs of the institution.

Demographic trends and assumptions regarding the population are also significant contributors to determining future demand (Green & Myers, 2004). Studying these trends allows analysts to better predict both the type and quantity of services that may be utilized in the future. In many service industries including healthcare, utilization is frequently used as a proxy measure for demand. Research indicates population size and age distribution have been found to be major indicators of the utilization of medical services (Bergwall et al, 1984). In fact, age is considered by many researchers to be the best single predictor of the utilization of medical services, as well as the type and intensity. Folland, Goodman, & Stano (2004) supported age as a predictor when they concluded older populations utilize healthcare services nearly three to four times more than their younger counterparts.

Forecasting Methodologies

Finarelli & Johnson (2004) discussed the process of forecasting as a critical aspect of planning for any new service line or facility. Their research article on demand forecasting delineated a nine-step forecasting process using two conjoining frameworks, population-based demand and provider-level demand that can serve as the basis for forecasts. The researchers indicated an assessment of the population to be served is critical because the geographic service area, population size, age mix, and rates of utilization are primary drivers for healthcare demand. Additionally, for the evaluation of provider-level needs, planners must account for factors such as capacity, facility configuration, competition, and productivity. Although all of these factors are important, future workload expectations will be the primary determinant in establishing appropriate staffing and capacity levels.

Beech (2001) outlined a market-based forecasting process which emphasized the targeted service area, population demographics, historical utilization rates, market share, and overall

demand for services. He declared the market-based approach is an objective approach that can minimize "educational guesses" as the root of predictions. This approach involves the quantitative analysis of utilization data rather than simply adjusting the previous years output by an arbitrary value. Beech concluded even if perfect information is unavailable, a more objective approach is leadership's first step towards better planning and decision making.

Numerous methodologies are available to assist analysts with forecasting future utilization. Most methods are classified as either qualitative or quantitative (Frazier & Gaither, 2002). Qualitative forecasts are typically subjective opinions or judgments that are not rooted in mathematical calculations or analysis. These forecasts can be based on survey results, market research, or expert opinions. In contrast, quantitative forecasting is an objective approach that involves the use of econometric or statistical models to compute future projections. Linear regression, simple and weighted moving averages, and exponential smoothing are a few of the techniques used in this type of forecasting.

Many of the quantitative approaches involve time series analysis. Time series analysis is based on historical data and analysts assume that underlying past patterns in the data can be used to predict future demand (Frazier & Gaither, 2002). Time series data is numerical information that is measured or recorded over successive periods such as days, months, or years. Some of the time series models are exponential smoothing, moving average, and trend line. These methods help analysts conduct reliable long and short-term forecasts that can be helpful in strategic decision making concerning future facilities or products.

One of more direct quantitative methods of estimating the future demand for health services is extrapolating detectable trends in historical utilization data to the out years (Thomas, 1999). In this method, an identified percentage of growth or decline in utilization is carried out over the

duration of the forecast. Thomas indicated population-based forecasting models combining population projections and utilization rates have gained in popularity over the years. This technique involves dividing the total number of patient visits or relative value units (RVUs) for a given service by the number of patients enrolled to the facility. A utilization rate is computed and multiplied by the projected number of enrollees in the year of interest. The demand figure will indicate the expected level of service to be provided for the specified year. Thomas believed this method is valuable because it closely reflects the size and demographic make-up of the population which have demonstrated to be strong indicators for future consumption. Cole & Tucker (2001) also found utility in using historical utilization as the basis for conducting forecasts for future medical services. However, they point out analysts must be conscious of any potential uncontrollable external or internal factors that may effect services in the future.

Identifying Human Resource Requirements

After determining an expected level of consumer demand, analysis of manpower requirements is often the next important component of facility and health services planning. For Naval forces, the Manual of Navy Total Force Manpower Policies and Procedures, OPNAV Instruction 1000.16J, (1998) stated manpower requirements should be based on actual or projected workload for approved operational requirements in support of the command mission. These requirements represent the minimum staffing necessary for performance of all assigned functions. Chapter one of the manual provided the following criteria for determining manpower requirements:

1. Determine the organization's mission, required functions, and workload.
2. Evaluate the minimum number of staff required to support the organization's mission, functions, and tasks.

3. Determine the optimal mix of military, civilian, and contract personnel needed to perform the mission, functions, and associated workload.
4. Classify the manpower requirements based on skills required and necessary functions to be performed

Sethi & Schuler (1989) characterized human resource planning as an interactive process of identifying the right people with the right training in the right place to perform the essential tasks to help the organization achieve its objectives. The authors detailed a six-step process for matching staffing levels to expected service demand. For healthcare, utilization rates derived from patient visits or the numbers of procedures performed are common service demand indicators. The general goal of manpower planning should be to ensure the organization has enough personnel to match but not exceed the present or future demand for its services (Sorkin, 1977).

Weiner (2004) researched the staffing models of eight large prepaid group practices (PGPs) owned and operated by health maintenance organizations (HMOs). These organizations provided primary care to more than eight million enrollees. He discussed several approaches routinely used by these healthcare organizations to establish medical workforce requirement benchmarks, such as economic demand and clinical need. Research findings specified that across the PGP's studied, the overall physician and non-physician provider staffing ranged from approximately 174 to 202 providers per 100,000 enrollees, well below the national average of 270 per 100,000. The importance of these findings was healthcare organizations in both urban and suburban settings demonstrated the ability to provide high-quality, cost-effective medical care to enrolled beneficiaries with considerably fewer practitioners than national averages.

Bergsten, Dial, Gabel, Palsbo, and Weiner (1995) also performed a nationwide survey of staff and group-model HMOs to determine key drivers in developing staffing models. Their findings indicated planned enrollment was a major determinant used by HMOs to gauge clinical staffing needs. More than 77% of responding HMOs confirmed they base staffing needs on this criterion. Other criteria highlighted were patient wait times, number of visits, geographic coverage, and cost. Bergsten et al. also found approximately 59% of the HMOs reported they employed benchmark enrollee- to- primary care physician ratios to project staffing needs. The most common benchmark or target ratio utilized was 2,000 adult members per primary care physician. However, these ratios changed as more HMOs began utilizing non-physician practitioners to deliver care to beneficiaries. Reeves (2002) also supported the use of industry benchmarks to determine staffing. She stated physicians can develop a staffing plan for their services by comparing their practice to industry standards for similar size-facilities, and making subsequent adjustments for the level of services provided.

Productivity of Workforce

In a downsizing facility such as the NH Charleston, maximizing productivity and efficiency becomes a major key to its future success. After determining what services to provide and related manpower requirements, the NH leadership must monitor and measure the productivity of its workforce. The Navy Total Force Manpower Requirements Handbook (2000) outlined methods to conduct work measurements to evaluate and validate the productivity of workers. This analysis improves a command's capability to estimate future workload requirements and can also evaluate the effects of reducing or eliminating manning on the organization. Studying the effects of staff reductions permits leadership to evaluate the overall impact on the organization and at

the micro-level, focusing on individuals or departments within the organization. The goal is to not adversely effect one department through elimination of positions in other departments.

Productivity is often mistakenly used synonymously with workload but an important distinction between the two terms exists. Workload in this study is the sum total of RVUs performed over a time period. Conversely, productivity reflects the link between resource outputs and inputs. Donabedian (1973) described the concept of productivity as, "a measure of the relationship between output and input when both are expressed in real physical volume terms" (p. 246). He expressed this relationship as Productivity = Total Output/Total Input.

Prior Studies of Naval Hospital Charleston

An economic analysis was initiated in 2004 to support facility planning at the NH for the new clinic. Altarum Institute's (2004) analysis focused on health care requirements for projected enrollees at the NHC. Particularly, the researchers evaluated whether to "make or buy" healthcare services at the NH versus the civilian health care network. Researchers estimated and compared the annual costs of providing direct care in the MTF to the costs of purchasing care in the network setting. Altarum noted a service should be provided at the MTF if it costs less to produce at the MTF than purchase the same level of care in the network. Based on the study, Altarum concluded the following clinical services were more cost-effective in the MTF setting: (a) General Surgery, (b) Internal Medicine, (c) OB/GYN, (d) Occupational Therapy/ Physical Therapy, (e) Optometry, (f) Orthopedics, and (g) Primary Care. However, (a) Dermatology, (b) Ophthalmology, (c) ENT, (d) Urology, (e) Mental Health, and (f) Audiology services were deemed more cost-effective in the network. The final report pointed out the NH would realize approximately $20.8 million dollars in annual savings by providing the cost-effective MTF

services in-house rather than sending this care into the network. The results of the study played an important role in the sizing and configuration of the proposed facility.

The Multi-Service Market Office, a centralized DoD healthcare resource coordinator located in Charleston, conducted an analysis of the current and future medical provider staffing requirements at the NH. Feldman & Richardson (2005) investigated 11 clinical areas in the hospital using FY 2004 and 2005 patient visit and outpatient RVU data. Their analysis found that 10 of the 11 clinical practices studied, including 9 of the specialties in this study, had work levels sufficient to justify the allocation of provider resources to these areas. Research findings further signified staff resources should not be dedicated to Dermatology due to a lack of demand for its services. A comparison of Feldman & Richardson's results to the current NHC staffing plan revealed only OB/GYN and ENT matched the proposed plan. Lastly, the provider staffing requirements for Optometry and Mental Health were greater than the planned figures and 3 of the specialties needed fewer practitioners.

Methods and Procedures

Research Design

A retrospective study consisting of a service-by-service demand analysis of select medical specialties was conducted to determine if sufficient demand exists to implement these practices at the future NHC. Currently, 11 specialty practices, as well as Family Practice and Pediatrics, are planned for the new facility as a result of the previous REDE team analysis. The following medical services were included in this study: (a) Cardiology, (b) Dermatology, (c) General Surgery, (d) Internal Medicine, (e) OB/GYN, (f) Optometry, (g) Orthopedics, (h) ENT, (i) Psychiatry, and (j) Psychology. Psychiatry and Psychology services are often referred to collectively as Mental Health services. Other planned clinical areas such as Primary Care,

Pediatrics, and Aviation/Undersea Medicine were not included in this study because the services have been mandated to be provided at the NHC, regardless of the outcome of this analysis.

Sufficient demand in this study is defined as the aggregate workload for a specialty service that warrants the employment of a full-time equivalent (FTE), in this context, a healthcare provider, in accordance with Navy Medicine annual benchmark standards for clinical practices. Navy Medicine currently utilizes a modified form of the Medical Group Management Association (MGMA) standards for academic clinical practices to set benchmarks for provider productivity and provider-to-patient ratios in MTFs. The MGMA (2002) benchmarks were initially developed from aggregate survey data regarding provider compensation and productivity collected from clinical science departments and practice plans representing medical schools in the U.S. These benchmarks, updated annually, reflect median and incremental percentile values of practitioner compensation levels and workload production in terms of outpatient RVUs and patient encounters. Scheduling templates from the Naval Medical Center Portsmouth, the headquarters for Navy Medicine East, are also utilized as best business practices for some clinical areas. These standards detail the expected workload production of a provider in a given year.

In 2005, Navy Medicine East, under the direction of Rear Admiral Thomas Burkhard, released healthcare productivity targets (or standards) for most practices based on 75% of the MGMA benchmarks for academic practice settings (Bureau of Medicine and Surgery, 2005). These targets represent 50% of the private practice median and are based on 36 clinical hours per week, 208 workdays per year, with provisions included for four weeks of leave, one week of continuing medical education, and one week of temporary assigned duty. Given the intricacies of the MHS and lack of previously existing productivity targets, RADM Burkhard believed

military providers should be able to produce at least 50% of the care being delivered by their civilian counterparts. The standards currently employed at the NH are illustrated in Table 1.

Table 1.

Fiscal Year 2006 Navy Medicine Annual Specialty Benchmarks for Staff Providers, Expressed in Patient Encounters and Relative Value Units (RVUs)

	Patient Encounters (Visits)	Relative Value Units (RVUs)
Cardiology	2800	5950
Dermatology	6200	5600
General Surgery	1850	6250
Internal Medicine	3700	3850
Obstetrics/Gynecology	2550	6100
Optometry	2770	3960
Orthopedics	3450	7000
Otolaryngology (ENT)	2950	5800
Psychiatry	2050	3400
Psychology	1650	3050

Note. From Navy Medicine Annual Specialty Benchmarks for Staff Providers, (Bureau of Medicine and Surgery, 2005).

Data Source

The primary data source is the MHS Management Analysis and Reporting Tool, referred to as the MHS Mart (M2). M2 is an integrated information data warehouse that contains summarized and detailed clinical, population, and financial data from all MTFs in the MHS. The tool permits authorized users access to patient-level data for direct and network purchased care in both outpatient and inpatient settings. The system is intended to enhance decision making for

healthcare executives by providing the capability to perform trend analyses, utilization studies, patient and provider profiling, and business case analyses.

Four major information systems feed into the MHS Data Repository, the primary data source for M2 (Patient Administration Systems & Biostatistics Activity ((PASBA), 2005). The MHS Data Repository receives information from MTFs, Department of Defense (DoD) agencies, and other business partners via the following reporting mechanisms:

(1) Composite Health Care System Legacy (CHCS) & Armed Forces Health Longitudinal Technology Application (AHLTA, formerly CHCS II): primary automated medical information systems, both clinical and administrative, for the DoD.

(2) Medical Expense and Performance Reporting System (MEPRS) Executive Query System (MEQS): repository of summarized data that enable queries and analysis of resources expended to deliver healthcare and maintain readiness such as military labor expense reporting.

(3) Defense Enrollment and Eligibility Reporting System (DEERS): centralized database for personnel information and medical benefits eligibility within the DoD.

(4) Managed Care Support Contractors (MCSC): detailed clinical, administrative, and financial data related to purchased medical care provided in network facilities.

The Tri-Service Business Planning Tool was also used to gather baseline data pertaining to the beneficiary population, geographic distribution of beneficiaries, and limited previously estimated demand for services at the new facility. Business plans are created annually by Navy healthcare organizations to establish operating targets for the amount of medical services to be provided at the MTF and the resources that will be required to perform them. These documents essentially serve as a guide to MTF business practices and pursuit of command strategic goals.

Population of Interest

The primary population of interest is patients enrolled to the NH with the beneficiary designation of active-duty service member (AD) and active-duty family member (ADFM). This segment is comprised of males and females ranging from under 1 to 64 years of age. Approximately 70% of this population is between the ages of 18 to 44 and 65% are males. Nearly 95% of the AD population is between the ages of 18 to 44, with 89% of the male gender. Since the ADFM category is primarily comprised of children and spouses, the age distribution range is larger but about 84% of these subjects are under the age of 44 and 66% are female.

Subsequent analysis was conducted on two other beneficiary categories, designated as retirees (RET) and retiree family members (RETFM), to determine their potential effect on the demand for medical services. This group is also both male and female with 62% of these individuals between the ages of 45 to 64. In the RET category, 87% of these subjects are in this age demographic.

Workload Accounting in Military Treatment Facilities (MTFs)

Two methods for workload accounting are currently used by the MHS, the relative value unit (RVU) and the actual number of patient encounters. The relative value unit metric is the primary tool used to account for provider workload. The concept, developed by the Centers for Medicaid and Medicare (CMS), created a standard method of reimbursing physicians for medical services they provided. RVUs measure the relative level of effort, skill, and resources expended by a practitioner in the diagnosis and treatment of a particular illness (Anderson & Glass, 2002). The RVU is a numerical value that quantifies the worth of a specific medical service or procedure. As the RVU value associated with a service or procedure increases, so does the worth of that RVU in terms of monetary or workload accounting (Bergey, 1991). One advantage of

using RVU accounting for measuring productivity is it permits standardized comparisons among providers from different medical specialty areas both within and external to the organization (Shackelford, 1999). The second workload measure used in the MHS is the aggregate number of patient encounters. An encounter is recorded with each patient visit to a provider within an MTF for medical care.

Data Collection and Analysis

Key variables that factored in the collection and analysis phases were the patient population and historical workload data. Historical utilization data in terms of outpatient RVU workload were retrieved from the M2 database for both direct, in-house care and purchased network care for each medical service over the previous two years, 2004 and 2005. This utilization data represents the aggregate workload delivered in the MTF and the civilian healthcare network administered by Humana, the Navy's local Managed Care Support Contractor. It serves as the historical record of usage, essentially the demand for care. Direct care data encompasses all medical services performed in a MTF. Purchased care includes medical services that were performed outside of a MTF by network providers. Since research has demonstrated the usefulness of historical utilization rates in forecasting future demand, the data for this period was used to conduct a forecast of demand for the medical services at the NHC.

Outpatient RVU data including Ambulatory Patient Visits (APVs) were collected for each clinic/service using Defense Medical Information System (DMIS) Identifier (ID) codes and Medical Expense and Performance Reporting System (MEPRS) codes that correspond to specific treatment facilities and clinics respectively in the MHS. Data was segregated by MEPRS code, beneficiary category, treatment site, and fiscal year (FY) and month. The four major beneficiary categories that were used include (a) Active Duty (AD), (b) Active Duty Family Members

(ADFM), (c) Retiree (RET) and (d) Retiree Family Members (RETFM). Each category was further stratified by age and gender to evaluate the demographic composition of the population. These beneficiary categories are recognized classifications used throughout the MHS. In order to gauge the total demand picture for each service, data was collected for each service for DMIS ID 0103 (Naval Hospital Charleston), 0511 (BMC Naval Weapons Station), and 0356 (437th Medical Group), along with all network care performed outside of the MTF. The BMC and 437th Medical Group were included because the NH is the parent command for the BMC and beneficiaries from both locations receive specialty care at the NH.

All retrieved data were inspected for completeness and abnormalities. After inspecting the data for the two-year period and consulting with the NH leadership team, 2004 utilization data were excluded from subsequent analysis due to large unexplainable variations in the data. These variations in 2004 were attributed to errors related to incorrect medical procedure coding and non-Skill Type 1 and 2 providers receiving credit for workload performed. Under current MHS guidelines, these types of providers are not permitted to accumulate recordable RVU workload. Skill Type 1 and 2 providers are designated as RVU count providers whose workload is coded and recorded during the diagnosis and treatment of patients. The RVUs produced by these providers serve as the basis for MTF productivity studies and manpower analysis. Skill Type 1 providers are defined in the Medical Expense and Performance Reporting System for Fixed Military Medical and Dental Treatment Facilities (2000) as clinicians to include physicians, dentists, and veterinarians. Skill Type 2 are direct care professionals, non-physicians, that are licensed or certified to deliver care to patients and include, but not limited to, physician assistants, nurse practitioners, physical and occupational therapists, psychologists, and nurse

midwives. The errors occurring with recording non-RVU care have been corrected by the NH and are not reflected in the FY 2005 data.

Forecast Models

Two demand models were developed using twelve months of historical outpatient RVU workload that occurred in FY 2005. In the first model, time series analysis was performed using Crystal Ball, a commercial forecasting software package. The program analyzes a data series and runs multiple simulations to determine the best fitting forecast method with the smallest mean square error. This error measurement is often used to evaluate forecast model accuracy. This information is used to forecast demand out for a specified number of future years. The program identified exponential smoothing as the best fitting method for the data used in this study. An example of the program output for Internal Medicine is presented in Appendix A. The variables that underlie the forecast are historical demand in terms of monthly RVUs performed, the value that is being projected for each service, and time, expressed in months.

Exponential smoothing is useful in estimating future values and is used in this study to predict future demand for the healthcare services for the planned facility. From the Engineering Statistics Handbook (2005), exponential smoothing is described as:

> Exponential smoothing schemes weight past observations using exponentially decreasing weights. This is a very popular scheme to produce a smoothed Time Series. Whereas in Single Moving Averages, the past observations are weighted equally, Exponential Smoothing assigns *exponentially decreasing weights* as the observation get older. In other words, *recent observations are given relatively more weight in forecasting than the older observations*. In the case of moving averages, the weights assigned to the observations are the same and are equal to 1/N. In exponential smoothing, however, there are one or more

> *smoothing parameters* to be determined (or estimated) and these choices determine the weights assigned to the observations. (Section 6.4.3)

Exponential smoothing is appropriate for this study because the smoothing method places more weight in the estimate on the most recent observations, which lessens the influence of older data. The coding accuracy at the NH has steadily improved over the course of the year so stressing the more recent observations should likely create a more accurate measurement of workload. In addition, this method is indicated for non-seasonal data and does not require an extensive historical data set to produce forecast models. The data used in this study consists of 12 months.

For the second model, past utilization rates were used to develop an independent set of predictions for FY 2008. This method is often used in the MHS to project demand and is discussed in the Population Health Improvement Plan and Guide published by the TRICARE Management Activity. The technique works well for short-term forecasts but can become less accurate as the time horizon for the forecast is lengthened due to uncontrollable external factors.

The monthly RVUs performed for each service line in both the MTF and non-MTF network were aggregated for the entire FY and separated into direct and purchased care for each beneficiary category. Patient enrollment data for this period was also retrieved from the Managed Care Forecasting and Analysis System (MCFAS) and M2 to determine the enrolled population in each category for the NHC. The utilization rate formula used for each service line was:

FY05 Outpatient Utilization Rate = FY05 Outpatient RVU Workload / FY05 Enrolled Population

Separate utilization rates were calculated for each beneficiary category to determine each group's independent contribution to overall demand. After these rates were computed, the rate for each beneficiary group was multiplied by the respective future expected population to derive a forecast for future demand for each service line for each population category. This process was repeated for every clinic in the study.

Results of the demand estimations were compared to the Navy Medicine benchmarks for clinical practices to determine if adequate demand exists to justify the employment of a full-time practitioner to provide each service. These benchmarks establish ideal enrollment panel sizes for practitioners and workload standards that can be used to decide if the workload will fully utilize a FTE in the clinical area. For example, 75% of the MGMA benchmark for RVUs for a U.S. Navy ENT physician is 5800 RVUs per year (Bureau of Medicine and Surgery, 2005), or 26 RVUs per day. If the forecasted demand for ENT services in a given year is computed to be 5800 RVUs, the demand will likely justify the employment of one FTE, or an ENT physician in a MTF. The services that demonstrate adequate workload to warrant the allocation of full-time resources to perform it will be recommended for implementation. For services that lack sufficient demand, other beneficiary categories were studied to ascertain whether enrolling them can significantly contribute to recapturing medical care that is currently planned for outsourcing to the network. The additional enrollment may generate the necessary demand to allow the NHC to undertake providing the service.

Locally, the NH, within MHS parameters, draws a distinction between an assigned FTE and an available FTE which specifies the time availability for clinical practice in business decisions. An assigned FTE can be a military officer assigned to the command or an employed civilian or contractor. Due to the unique duties of a military officer, the NH uses a 0.80 equivalent FTE figure to represent the employment of 1.0 FTE, a military Skill Type 1 or 2 provider. In staffing configurations, a military officer would count as 1.0 assigned FTE but his or her availability to the designated clinic would be 0.80, rendering 80% of the employee's work time dedicated to clinical practice. This partial availability is reflected in the benchmark targets and is used to account for administrative requirements such as committee membership, collateral duties, and

physical and training readiness. All civilian FTEs count as 1.0 assigned and available because they do not bear the same administrative requirements and duties of assigned military personnel. This distinction is important when drafting manpower needs for a service or facility.

Results

The total medical care provided to each beneficiary category in 2005 for each specialty service is illustrated in Figure 2. This graph is helpful to visualize the distribution of care among eligible enrollees. Overall, AD and ADFM patients received 63% of the total RVU workload consumed by NH enrollees. This population dominated the use of the ENT, OB/GYN, Optometry, and Mental Health service areas. RET and RETFM patients comprised the remaining 37% of overall healthcare consumption. They were the principal customers for Cardiology, Dermatology, and Internal Medicine services.

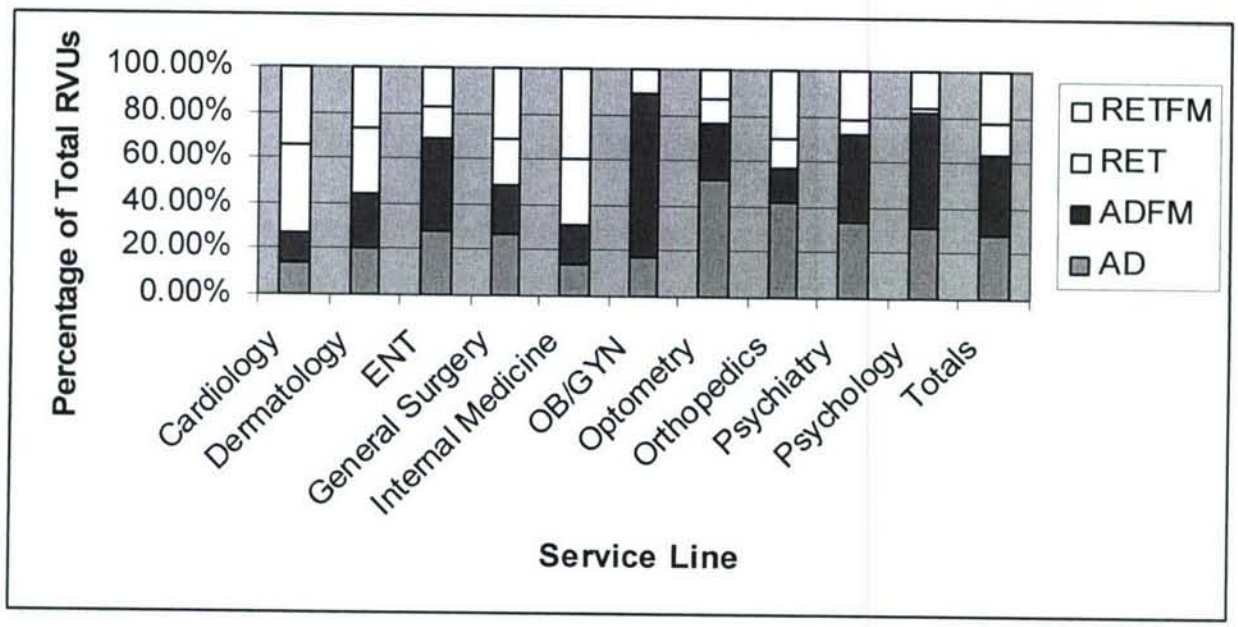

Figure 2. Percentage of Total Care Consumed, in terms of RVUs, by Beneficiary Category for Each Service Line, 2005.

Information Retrieved from Military Health System Management Analysis and Reporting Tool (M2), 2005.

The results of the forecast for each service line are noted in Table 2. The table lists the aggregate RVU workload reported for the care provided to AD and ADFM enrollees for each specialty in FY 2005, which underlies the forecasts. Two independent forecasts are also presented; one conducted using exponential smoothing and the latter computed using historical utilization rates. Both forecasts are expressed in expected RVU production in 2008. The table also shows the percentage change between the historical data and the forecasted values. The mean change expected using the smoothed forecast is an overall decrease of 5.41% while a larger overall decrease is noted in the utilization prediction with a mean change of -21.04%.

Table 2.

Historical and Forecasted Demand Values Using Exponential Smoothing and Utilization Rate Models

Service Line	**2005 RVU**	**Forecast, Exponential Smooth**	**Percent Change from 2005**	**Forecast, Utilization Rates**	**Percent Change from 2005**
Cardiology	1,395	1,202	-13.84%	1,258	-9.82%
Dermatology	1,812	1,869	3.15%	1,735	-4.25%
ENT (Otolaryngology)	4,464	4,422	-0.94%	2,835	-36.49%
General Surgery	4,327	4,402	1.73%	3,337	-22.88%
Internal Medicine	4,528	4,348	-3.98%	3,625	-19.94%
Obstetrics/Gynecology	16,049	16, 353	1.89%	12,277	-23.50%
Optometry	10,913	11,308	3.62%	7,493	-31.34%
Orthopedics	5,163	5,155	-0.15%	3,600	-30.27%
Psychiatry	6,135	4,684	-23.65%	5,157	-15.94%
Psychology	6,198	4,840	-21.91%	5,210	-15.94%

Note. Numerical values expressed in relative value units (RVUs) for each service line.

A comparison of planned and forecasted staffing needs for the specialty services are presented in Table 3. The service line, the NHC planned staffing figures (NHC plan) and the results of the demand forecast, in terms of staff needed to serve the AD and ADFM beneficiaries (AD/ADFM) are illustrated. This demand forecast was executed using time series analysis with single exponential smoothing. The quantities in the planned and forecasted staff columns represent the number of FTEs needed to serve the projected beneficiary population to be enrolled at the NHC in 2008. These numerical values are derived from the demand predictions in the previous table and the Navy Medicine annual benchmarks for each specialty. Using the .80 FTE staffing guideline to supply a specialty practice, the table conclusively illustrates the need for 1 specialist in Internal Medicine, 3 in OB/GYN, 3 in Optometry, 1 in Psychiatry, and 2 in Psychology. A quantity less than this guideline signifies only enough demand for a part-time employee. For example, in Dermatology with a forecasted staffing need of .33, indicates that demand only exists to employ an FTE less than 40% of the year.

Table 3 also demonstrates the projected incremental effects of enrolling RET and RETFM across all specialty service lines. The matrix shows the effect on staffing as persons are added in increments of 500. The calculated projections for the baseline minimum staffing for the NHC to treat the targeted population are indicated in the AD/ADFM column. The values to the right of this column show the cumulative staffing requirements necessary to serve the indicated number of retirees. For example, the Internal Medicine baseline staffing need is 1.13 providers, essentially 1 provider. If 3500 RET/RETFM beneficiaries are enrolled to the facility, the staffing requirements raise to 2.41, or 3 military practitioners. The ability to ascertain the effects on other services' staffing at this level are present by viewing the entire column by clinical area. This

matrix can be a helpful tool to gauge anticipated staffing requirements at differing levels of the retiree enrollment.

Table 3.

Forecasted Staffing Needs (Single Exponential Smoothing) for Naval Health Clinic Charleston with Incremental Effects of the Addition of Retirees and Retiree Family Members

Service Line	NHC Plan	AD/ADFM	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
Cardiology	0	0.20	0.25	0.29	0.34	0.38	0.43	0.47	0.52	0.57	0.61	0.66	0.70	0.75	0.80	0.84
Dermatology	1	0.33	0.36	0.39	0.43	0.46	0.49	0.52	0.55	0.59	0.62	0.65	0.68	0.72	0.75	0.78
ENT (Otolaryngology)	1	0.76	0.79	0.82	0.85	0.88	0.90	0.93	0.96	0.99	1.02	1.05	1.08	1.11	1.14	1.16
General Surgery	2	0.70	0.75	0.81	0.86	0.92	0.97	1.02	1.08	1.13	1.18	1.24	1.29	1.35	1.40	1.45
Internal Medicine	3	1.13	1.31	1.50	1.68	1.86	2.05	2.23	2.41	2.60	2.78	2.96	3.15	3.33	3.51	3.69
Obstetrics/Gynecology	5	2.68	2.71	2.73	2.76	2.79	2.82	2.84	2.87	2.90	2.92	2.95	2.98	3.01	3.03	3.06
Optometry	1	2.86	2.93	3.00	3.07	3.14	3.21	3.28	3.35	3.42	3.48	3.55	3.62	3.69	3.76	3.83
Orthopedics	3	0.74	0.78	0.82	0.87	0.91	0.95	0.99	1.03	1.08	1.12	1.16	1.20	1.24	1.28	1.33
Psychiatry	1	1.38	1.43	1.48	1.52	1.57	1.62	1.67	1.72	1.76	1.81	1.86	1.91	1.96	2.01	2.05
Psychology	1	1.59	1.62	1.66	1.69	1.73	1.76	1.80	1.83	1.87	1.90	1.94	1.97	2.00	2.04	2.07

Note. Numerical values expressed as projected number of full-time equivalent (FTE) Skill Type 1 or 2 providers needed for each service line.

A conservative estimate of service needs was conducted by projecting demand based on historical utilization rates with no expected growth reflected in utilization. A year-to-year growth or decline rate could not be determined with only twelve months of data. Similar to the previous table, Table 4 shows the service line, current planned staffing figures, and the forecasted baseline staffing needs for providing care to the projected patient enrollment in FY 2008. The table reveals demand is adequate for 1 Internal Medicine, 2 OB/GYN, 2 Optometry, 2 Psychiatry, and 2 Psychology Skill Type 1 or 2 providers. Additionally, the cumulative effects on staffing with the enrollment of retirees in 500 person increments are presented.

Table 4.

Forecasted Staffing Needs for Naval Health Clinic Charleston Based on Historical Utilization Rates with Incremental Effects of the Addition of Retirees and Retiree Family Members

Service Line	NHC Plan	AD/ADFM	500	1000	1500	2000	2500	3000	3500	4000	4500	5000	5500	6000	6500	7000
Cardiology	0	0.21	0.26	0.31	0.36	0.41	0.45	0.50	0.55	0.60	0.65	0.70	0.75	0.79	0.84	0.89
Dermatology	1	0.31	0.34	0.38	0.44	0.44	0.48	0.51	0.54	0.58	0.61	0.64	0.68	0.71	0.74	0.78
ENT (Otolaryngology)	1	0.49	0.51	0.54	0.56	0.58	0.61	0.63	0.65	0.68	0.70	0.72	0.75	0.77	0.79	0.82
General Surgery	2	0.53	0.58	0.63	0.68	0.73	0.78	0.82	0.87	0.92	0.97	1.02	1.07	1.11	1.16	1.21
Internal Medicine	3	0.94	1.12	1.29	1.46	1.64	1.81	1.99	2.16	2.34	2.51	2.68	2.86	3.03	3.21	3.38
Obstetrics/Gynecology	5	2.01	2.04	2.06	2.08	2.10	2.13	2.15	2.17	2.20	2.22	2.24	2.26	2.29	2.31	2.33
Optometry	1	1.89	1.94	2.00	2.05	2.10	2.15	2.21	2.26	2.31	2.36	2.41	2.47	2.52	2.57	2.62
Orthopedics	3	0.51	0.55	0.59	0.63	0.67	0.71	0.75	0.79	0.83	0.87	0.91	0.95	0.99	1.03	1.07
Psychiatry	1	1.52	1.57	1.63	1.68	1.74	1.79	1.85	1.90	1.96	2.01	2.07	2.13	2.18	2.24	2.29
Psychology	1	1.71	1.75	1.78	1.82	1.86	1.90	1.93	1.97	2.01	2.05	2.08	2.12	2.16	2.20	2.23

Note. Numerical values expressed as projected number of full-time equivalent (FTE) Skill Type 1 or 2 providers needed for each service line.

Discussion

The focus of this study was to determine the scope of specialty care services that should be provided at the future NHC based on anticipated demand. Two independent methods were used to forecast future demand and staffing needs for the selected clinical areas. Results of the study indicate both forecast models delineate the need for 5 of the 10 service lines researched. These results signal the demand for care of active duty service members and their families limits the need for certain specialty services. The age range of the targeted population is likely a limiting factor for select clinical areas that predominantly treat an older patient population. Outcomes of this analysis further indicate if the command implements the current staffing plan developed in 2004, excess capacity could be prevalent in a majority of the specialty service lines. Excess capacity would mean the command has too many providers to serve the projected number and mix of enrollees. This potential issue could result in significant, unneeded labor costs and low

operating margins. The service and staffing concerns can be addressed by adopting an appropriate demand model and adjusting staffing levels to meet the forecasted demand. This notion is supported in the Population Health Improvement Plan and Guide (2001) which suggested that demand forecasts are essential to ensure facilities are appropriately sized and staffed, both in number and mix, to serve its targeted population.

Comparison of Forecast Models

Time series analysis projects the clinical staffing needs for the services researched will be 10 providers, as opposed to 18, which is currently planned for billeting. These projections reduce the overall manpower needs by 44%. Under this scenario, adequate demand to establish practices for Dermatology and Cardiology does not exist. As stated earlier, the NH uses a 0.80 staffing equivalent for 1 assigned military FTE and a 1.0 equivalent for 1 assigned civilian employee. General Surgery, ENT, and Orthopedics are close to the 0.80 FTE threshold and could be provided with the premise of experiencing growth in the practices. However, in 2005, only 61% of the care consumed in all of the studied service areas, excluding Mental Health, by AD and ADFM enrollees at NH was provided in-house. Mental Health services were separated because it is an exempt medical service for ADFM patients meaning TRICARE does not require these patients to receive this care at the NH. The highest percentage of direct care received by AD and ADFM patients in a service line was in ENT, with approximately 90% of care occurring in-house. The lowest percentage of direct care received by the AD and ADFM segments, other than Mental Health, was in Internal Medicine, with only 45% of all care provided in the MTF. Given the percentage of medical care occurring in the network in these areas, 54%, 90%, and 74% respectively, only ENT is likely realize the needed growth to support opening a practice. The addition of ENT services increases provider needs by 1. The other specialty services, Internal

Medicine, OB/GYN, Optometry, and Mental Health, have the necessary demand for implementation at the NHC.

The forecast conducted using historical utilization rates projects the NHC specialty provider needs are only 9, essentially reducing the anticipated staffing needs by half. The results of this forecast signify there is not sufficient demand to support Cardiology, Dermatology, ENT, General Surgery, or Orthopedics practices. However, there is need for Internal Medicine, OB/GYN, Optometry, Psychiatry, and Psychology services, with Optometry, Psychiatry, and Psychology requiring more staff than the NHC planned figures. The NHC would either have to add more staff to cover these shortfalls or refer the care to the outside network.

A direct comparison of the results of the two forecasting techniques yields Cardiology, Dermatology, Internal Medicine, Psychiatry, and Psychology having comparable results. However, big differences in expected RVU production were noted in OB/GYN and Optometry, where utilization rates project a smaller need in the population of interest. The highest expected RVU producer in both scenarios is OB/GYN, which may be indicative of the large number of child-bearing aged persons in the AD and ADFM population. Both techniques also predict overall demand for Cardiology, ENT, Internal Medicine, Orthopedics, Psychiatry, and Psychology services are expected to decline over the period. Lastly, the smoothed forecast predicts demand for Dermatology, General Surgery, OB/GYN, ENT, and Optometry will increase in the coming years while the utilization method shows a declining trend.

Overall, historical utilization rates project a lesser need for specialty services at the NHC. Of the medical practices studied, only five clinical specialties should be opened. Conversely, under the first scenario, the NHC could support the operation of six service lines resulting in the elimination of Cardiology, Dermatology, Orthopedics, and General Surgery. However, both

methods adequately support establishing operations for Internal Medicine, OB/GYN, Optometry, and Mental Health services.

Care for the Retiree Population

The topic of transitioning retirees and their family members to network providers continues to spark debate. Should the NHC management roll out a full-service clinic with all 10 specialties for the purpose of providing another training ground for clinicians or staff to the needs of its targeted population of active duty forces and their families? The answer to this question is not simple. Two factors are important to consider. First, the AD and ADFM demographics typically do not require a large degree of highly specialized care. Secondly, research suggests older populations access healthcare three to four times more than their younger counterparts. The simple addition of more staff to specific service lines does not meet this need. This segment brings its own set of healthcare needs which can widely vary from the younger active duty enrollees.

One additional avenue explored in this study was the effects on provider needs associated with the additional enrollment of retirees and retiree family members who are now planned to be transitioned to the network. The effects of this scenario are presented in the staffing matrixes in Tables 3 and 4. The matrixes can be used by management to evaluate how staffing needs change with the addition of differing levels of this population. No optimal level of enrollment was identified and the matrix is presented as a tool for management contemplating this scenario. With increasing levels of enrollment, each service area is affected on a varying basis. For the services deemed appropriate for the AD and ADFM segments, RET and RETFM patients were moderate to high consumers of Internal Medicine and ENT services in 2005, but significant consumption of Mental Health, OB/GYN, and Optometry services was not apparent. The acquisition of retiree

care in these clinical areas would require additional resources beyond what is needed to care for the targeted AD and ADFM populations. A more detailed analysis of the healthcare needs and costs particular to the retiree segment for the studied services and other clinical areas not included in this research such as Primary Care, is necessary and beyond the scope of this analysis.

With the aim of covering any potential demand shortfalls for its future services, the NHC should first attempt to recapture any care for the AD and ADFM patients the MTF is capable of performing that is occurring in the network. Secondly, leadership can employ an aggressive referral management program to ensure the facility is maximizing its specialty workload within the MTF. The NHC can also institute the right of first refusal (ROFR) on those medical services provided in-house to lessen medical care leaking to the network. The ROFR system provides a means for MTF commanders to require specialty care referrals, with the exception of TRICARE mandated exempt services, to be screened by MTF clinicians to determine if the work can be performed onsite before being sent to the network for treatment. A thorough business case analysis on each service area should be conducted to determine how much care can potentially be recaptured at the NHC and how significantly it could contribute to the financial position.

Medical Procedure Coding

Although the MHS-wide deployment of the AHLTA to MTFs is expected to increase workload accounting reliability, precise medical coding presently remains a major challenge. Medical coding primarily consists of International Classification of Diseases (ICD-9), Evaluation & Management (E&M), and Current Procedural Terminology (CPT)/Healthcare Common Procedure Coding System (HCPCS) codes. These codes correspond to billing codes for medical procedures and diagnoses rendered by practitioners during the treatment of patients. With the

implementation of AHLTA, healthcare providers are responsible for the primary medical coding of patient visits. The auditors review the results of the provider's input on a monthly basis and compare it to what the coder has determined to be correct based on medical record documentation. If the practitioner coding matches the auditor's results, it is considered accurate. If the codes do not match, the record is recorded as incorrect in the provider's profile, and the results are briefed to the responsible provider at the end of the month. However, the coding record is not amended at the conclusion of this process. The auditing process exists for quality assurance purposes only. An exception to this process is third-party billing to other health insurance companies, wherein 100% of all coding is audited prior to submission of bills.

Coding accuracy continues to improve as practitioners become more knowledgeable about medical coding, but it is uncertain whether RVUs or patient encounters are currently the most accurate source of workload data for MTF providers. Since many business decisions are increasingly based on RVU data, it is critical to ensure inputs are accurate and reflective of ongoing operations. RVU accounting by network providers has been considered highly reliable because it forms the basis for the reimbursement for services made by the federal government to these facilities.

Reliability and Validity

In order to assure the reliability of the study's results, the computation techniques utilized in the two models were carried out in the same manner for each individual clinical practice and measured against standardized Navy Medicine clinical benchmarks. Both techniques are noted in literature as dependable methods for forecasting future demand. The integrity of the data is also considered high because the M2 database serves as the primary data repository for clinical information for the entire MHS and is continuously managed by the Military Health Systems

Organization. Finally, the results from both models indicate a need for the same five specialty practices even though two techniques with differing methodologies were used in the study. These findings also have commonalities with results of similar analyses performed on the NH and its enrolled population. Some differences in the Feldman & Richardson study results and this study were expected due to the inclusion of patient encounters and 2004 data in the previous research.

The accuracy of the predictive models was evaluated by conducting subsequent forecasts for each service using the same techniques from the study for the initial four months of FY 2006. The results of these forecasts were then compared to actual workload for this period. Only 4 months were utilized because complete direct and network care data was retrievable from M2. Forecast results from time series analysis overestimated total RVU production for all services by 10%. There was a 21% underestimation in the prediction made using utilization rates for this time period in 2006 and the actual RVU production for all services. These differences could be attributed to the ongoing improvement in coding accuracy.

Limitations

A major assumption of the forecasting methodologies used during this research is what has occurred or is occurring will continue in the future years that are being forecasted. Prospective changes in utilization patterns attributable to the global war on terrorism, technological advances in drug therapies and practice patterns, or natural occurrences of communicable diseases cannot be predicted with a high degree of certainty. These events could significantly increase or decrease the need for medical services, particularly the type and scope.

Additionally, a limitation of this study is the accuracy of medical coding at the NH. Although overall coding accuracy steadily improved in FY 2005, exact workload accounting remains a significant challenge. At the end of FY 2005, the command had an overall coding

accuracy rate of 72 %. Currently, coding accuracy is determined through audits performed by certified medical coders on a monthly basis, through audits of 25 records per provider per month. The author is uncertain whether the sampling used in the auditing process is sufficient to ascertain accurate coding compliance. Aggregate RVUs derived from the medical coding process comprise the backbone of this study. The future projections developed to establish the need for each service line are also directly effected by this process. An assumption was made that the RVUs used to conduct this analysis are the best available measure of workload for the NH.

Another limitation to be considered is the projections indicate the best case scenario of 100% of all medical care provided to enrollees occurring directly at the NHC. Forecasts were conducted with this assumption because of the author's intent to capture the total demand for a given service, whether it was performed inside the MTF or in the network. It has been demonstrated historically that a variable quantity of medical care will undoubtedly occur in the network due to capacity issues, special medical studies, or medical procedures that cannot be performed onsite. TRICARE mandated exempt medical services are also a factor. For example, in 2005, 99% of all Psychology and Psychiatry services, designated as an exempt medical service for ADFM patients, utilized by ADFM beneficiaries occurred in the network. For these reasons, it is not possible to capture all of the care that beneficiaries need within the walls of the MTF.

Lastly, the forecasts performed in this study reflect only 12 months of data. Larger data sets with a longer time horizon of observations are preferred for middle to long-term forecasts. More data points can help researchers identify any definable trends or seasonal effects that may not be apparent in short-term measurements of data. Subsequent analysis should be performed in the future, perhaps at the completion of the next fiscal year to determine the effect of another year's data on the forecasts for these medical services.

Conclusion

Future studies involving the demand for medical services should focus on the limitations identified in this study. Additional analysis may also be required to study the likelihood of external factors such as changes in clinical practice patterns, military healthcare policies, MHS funding, and population demographics that were not occurring or evident during the performance of this analysis. Significant future changes in these factors could alter the outcomes proposed in this research. Furthermore, updated business case analyses for each service line, focusing on the costs of providing care, may be desirable to ascertain whether the NHC should "make" or "buy" the medical services demanded by its beneficiaries.

The proper and accurate accounting of workload is crucial to future decision making. The current practices of coding in the MHS should be monitored and studied to ensure it supports best business practices for our physicians and the clinics they support. MTF executives could undertake the placement of certified medical coders in high-volume patient care areas to consult with providers with the aim of increasing the accuracy of procedure coding. The intention is not to find fault for coding inaccuracies but to highlight the need for future reevaluation of the current process. Since the RVU is increasingly being used for business decisions, it behooves the MHS to employ the most qualified personnel to document the care that directly affects the organization's value of care.

In conclusion, management at the NHC should consider adjusting staffing levels to meet the expected demand for its AD and ADFM enrollees. Although forecasts are not certain to become reality in the future, utilizing it as a planning tool is likely to reduce the probability of employing providers in excess of what is needed to care for the patient population. Two models have independently revealed the need for 5 of the 10 clinical areas included in the study. Ultimately,

optimizing resources will help the facility achieve its goals of providing the ideal mix of medical services demanded by its population, maximizing the value of care, and experiencing more beneficial operating margins.

Appendix A

Internal Medicine Forecast Data and Results (Exponential Smoothing)

Report for INT MED Forecast (AD/ADFM)
Created: 2/9/2006 at 8:52:02 PM

Summary:
Number of series: 1
Periods to forecast: 36
Seasonality: none
Error Measure: RMSE

Series: Total DC & PC **Range: L2:L13**

Method: Single Exponential Smoothing
Parameters:
Alpha: 0.595
Error: 55.957

Series Statistics:
Mean: 377.3666667
Std. Dev.: 56.92507473
Minimum: 306.91
Maximum: 457.17
Ljung-Box: 2.6431

Forecast:

Date	Lower: 5%	Forecast	Upper: 95%
13	265.7804408	362.3103319	458.8402229
14	252.9574872	362.3103319	471.6631766
15	224.5743423	362.3103319	500.0463215
16	203.114102	362.3103319	521.5065618
17	222.7056921	362.3103319	501.9149717
18		362.3103319	
19		362.3103319	
20		362.3103319	
21		362.3103319	
22		362.3103319	
23		362.3103319	
24		362.3103319	
25		362.3103319	
26		362.3103319	
27		362.3103319	
28		362.3103319	
29		362.3103319	
30		362.3103319	
31		362.3103319	
32		362.3103319	
33		362.3103319	
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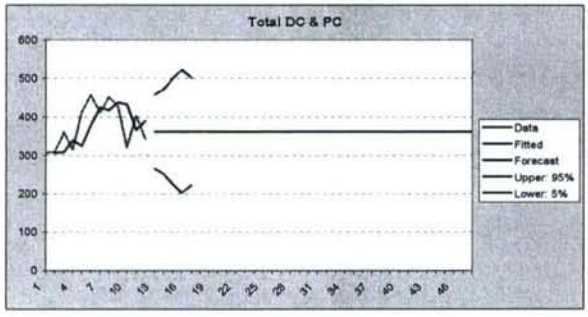
37		362.3103319	
38		362.3103319	
39		362.3103319	
40		362.3103319	
41		362.3103319	
42		362.3103319	
43		362.3103319	
44		362.3103319	
45		362.3103319	
46		362.3103319	
47		362.3103319	
48		362.3103319	



Method Errors:

	Method	RMSE	MAD	MAPE
Best:	Single Exponential Smoothing	55.957	44.829	11.87%
2nd:	Single Moving Average	57.811	44.621	11.80%

Method Statistics:

	Method	Durbin-Watson	Theil's U
Best:	Single Exponential Smoothing	2.103	0.879
2nd:	Single Moving Average	2.006	0.845

Method Parameters:

	Method	Parameter	Value
Best:	Single Exponential Smoothing	Alpha	0.595
2nd:	Single Moving Average	Periods	2

Series: Total DC & PC

Date	Data	Fitted	Forecast	Upper: 95%	Lower: 5%
1	306.91				
2	309.87	306.91			
3	360.57	308.6725139			
4	316.31	339.5745541			
5	413.96	325.7218179			
6	457.17	378.262703			
7	412.3	425.2475697			
8	451.65	417.5380186			
9	430.03	437.849789			
10	321.58	433.1935435			
11	403.7	366.7339426			
12	344.35	388.7451551			
13			362.3103319	458.8402229	265.7804408
14			362.3103319	471.6631766	252.9574872
15			362.3103319	500.0463215	224.5743423
16			362.3103319	521.5065618	203.114102
17			362.3103319	501.9149717	222.7056921
18			362.3103319		
19			362.3103319		
20			362.3103319		
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40			362.3103319		
41			362.3103319		
42			362.3103319		
43			362.3103319		
44			362.3103319		
45			362.3103319		
46			362.3103319		
47			362.3103319		
48			362.3103319		

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14. ABSTRACT

The purpose of this study is to determine the scope of medical services that should be provided to enrolled beneficiaries at the future Naval Health Clinic Charleston based on projected demand and demographics of the population. Twelve months of historical relative value unit (RVU) workload data were used to conduct forecasts to project the future demand for healthcare services in 10 specialty practices. Two independent predictive models were created using time-series analysis and utilization rates from the population of interest. Projections were evaluated against Navy Medicine annual benchmark standards for clinical practices to determine if sufficient demand existed to provide each service. Both independent methodologies indicated the need for 5 of the 10 specialty practices evaluated in the study. Results of this study suggest the demographic make-up of the targeted population likely limits the need for certain specialty services that typically serve an older population.

15. SUBJECT TERMS
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